

CLAIMS

What is claimed is:

1.—— A method for wireless communication at a user equipment (UE), comprising:
 identifying a first set of control channel resources in a first transmission time interval (TTI)
 of a plurality of TTIs in which repetitions of a downlink shared channel transmission to the
 UE are transmitted;
 rate-matching each repetition of the downlink shared channel transmission in each of the
 plurality of TTIs based at least in part on the first set of control channel resources to identify
 shared channel resources in each of the plurality of TTIs; and
 receiving the downlink shared channel transmission via the shared channel resources in each
 of the plurality of TTIs;

2.—— ~~The method of claim 1, wherein:~~
 the first set of control channel resources comprises a subset of a set of resources configurable
 for control channel transmissions, ~~and wherein~~
 the shared channel resources in each of the plurality of TTIs comprise at least a portion of the
 set of resources configurable for control channel transmissions; and

3.—— ~~The method of claim 2, wherein the first set of control channel~~
~~resources are configured semi-statically or dynamically.~~

4.—— ~~The method of claim 2, wherein the first set of control channel resources are~~
~~configured dynamically, and wherein the rate-matching comprises:~~
 determining a rate-matching mode for the first set of control channel resources based at least
 on a dynamic indication field in first control information;
 rate-matching the downlink shared channel transmission of the first TTI based at least in part
 on the determined rate-matching mode; and
 rate-matching each remaining TTI of the plurality of TTIs based at least in part on the rate-
 matching mode for the first set of control channel resources.

5.—— 2. The method of claim 41, wherein the first set of control channel resources are
configured semi-statically or dynamically.

3. The method of claim 1, wherein the dynamic indication field indicates rate-matching
around only the first control information or rate-matching around an entire resource block
(RB) set and whether such rate-matching is performed in the presence or absence of control
information within the first TTI, and wherein the rate-matching each remaining TTI is
performed according to the dynamic indication field and assuming that none of the remaining
TTIs include control information.

6.—— 4. The method of claim 41, wherein the rate-matching each remaining TTI is
performed according to a semi-static configuration to rate-match around an entire resource
block (RB) set.

7.—— 5. The method of claim 64, wherein the semi-static configuration is provided via radio
resource control (RRC) signaling.

8.—~~6.~~ The method of claim 1, wherein repetition information for the plurality of TTIs in first control information of the first TTI comprises a trigger to activate the repetitions of the downlink shared channel transmission.

9.—~~7.~~ The method of claim 1, further comprising:
receiving two or more instances of first control information in two or more TTIs of the plurality of TTIs, wherein each of the two or more instances of first control information are received via same control channel resources as the first set of control channel resources.

10.—~~8.~~ The method of claim 1, further comprising:
identifying a second set of resources for transmission of one or more of a physical broadcast channel (PBCH), a primary synchronization signal (PSS), and a secondary synchronization signal (SSS), and wherein the rate-matching further comprises rate-matching one or more repetitions of the downlink shared channel transmission around the second set of resources.

11.—~~9.~~ The method of claim ~~10~~8, wherein the rate-matching around the second set of resources is performed for each TTI of the plurality of TTIs irrespective of whether one or more of the PBCH, PSS, or SSS is scheduled in the TTI.

12.—~~10.~~ The method of claim ~~10~~8, further comprising:
determining that one or more resource blocks (RBs) of the downlink shared channel transmission of a second TTI is to be demodulated based at least in part on a demodulation reference signal (DMRS) scheduled in the first TTI;
identifying that a DMRS occasion of at least a first RB collides with the second set of resources in the first TTI; and
rate-matching the downlink shared channel transmission of the second TTI around the first RB in the second TTI.

13.—~~11.~~ The method of claim 1, wherein first control information in the first set of control channel resources indicates a number of repetitions of the downlink shared channel transmission.

14.—~~12.~~ A method for wireless communication at a base station, comprising:
identifying a first set of control channel resources in a first transmission time interval (TTI) of a plurality of TTIs in which repetitions of a downlink shared channel transmission to a user equipment (UE) are transmitted;

~~rate-matching each repetition of the downlink shared channel transmission in each of the plurality of TTIs based at least in part on the first set of control channel resources;~~
and

~~transmitting the repetitions of the downlink shared channel transmission in each of the plurality of TTIs.~~

15.—~~The method of claim 14,~~ wherein the first set of control channel resources comprises a subset of a set of resources configurable for control channel transmissions; and ~~wherein~~ shared channel resources in each of the plurality of TTIs for the downlink shared channel

transmissions comprise at least a portion of the set of resources configurable for control channel transmissions;

~~16.—The method~~rate-matching each repetition of claim 15, wherein the first set of control~~the downlink shared channel resources are configured semi-statically or dynamically.~~

~~17.—The method~~transmission in each of the plurality of claim 15,~~wherein TTIs based at least in part on the first set of control channel resources are configured dynamically, and,~~ wherein the rate-matching comprises:

~~dynamically~~ determining a rate-matching mode for the first set of control channel resources;

setting a dynamic indication field in first control information to indicate the rate-matching mode to the UE;

rate-matching the downlink shared channel transmission of the first TTI based at least in part on the determined rate-matching mode; and

rate-matching each remaining TTI of the plurality of TTIs based at least in part on the rate-matching mode for the first set of control channel resources; and
transmitting the repetitions of the downlink shared channel transmission in each of the plurality of TTIs.

~~18.—13. The method of claim 17~~12, wherein the first set of control channel resources are configured semi-statically or dynamically.

14. The method of claim 13, wherein the dynamic indication field indicates rate-matching around only the first control information or rate-matching around an entire resource block (RB) set and whether such rate-matching is performed in the presence or absence of control information within a TTI, and wherein the rate-matching each remaining TTI is performed according to the dynamic indication field and assuming that none of the remaining TTIs include control information.

~~19.—15. The method of claim 17~~13, further comprising:
providing a semi-static configuration to the UE to rate-match around an entire resource block (RB) set.

~~20.—16. The method of claim 19~~15, wherein the semi-static configuration is provided via radio resource control (RRC) signaling.

~~21.—17. The method of claim 14~~12, further comprising:

transmitting two or more instances of first control information in two or more TTIs of the plurality of TTIs, wherein each of the two or more instances of first control information are transmitted via same control channel resources as the first set of control channel resources.

~~22.~~—18. The method of claim ~~14~~12, further comprising:
identifying a second set of resources for transmission of one or more of a physical broadcast channel (PBCH), a primary synchronization signal (PSS), and a secondary synchronization signal (SSS), and wherein the rate-matching further comprises rate-matching one or more repetitions of the downlink shared channel transmission around the second set of resources.

~~23.~~—19. The method of claim ~~22~~18, wherein the rate-matching around the second set of resources is performed for each TTI of the plurality of TTIs irrespective of whether one or more of the PBCH, PSS, or SSS is scheduled in the TTI.

~~24.~~—A method for wireless communication at a user equipment (UE),
comprising:
~~receiving a plurality of repetitions of downlink control information (DCI) in a plurality of transmission time intervals (TTIs);~~

~~decoding at least a first instance of the DCI received in at least a first TTI of the plurality of TTIs; and~~

~~identifying uplink resources for acknowledging receipt of transmissions in all of the plurality of TTIs based at least in part on the first instance of the DCI.~~

~~25.~~—The method of claim ~~24~~, wherein the DCI indicates a number of repetitions of downlink shared channel transmission.

~~26.~~—The method of claim ~~24~~, wherein each repetition of the DCI includes an index indicating a location of the uplink resources relative to a TTI of the plurality of TTIs containing the DCI, and wherein the index of each subsequent repetition of the DCI is adjusted to indicate a same location of the uplink resources.

~~27.~~—The method of claim ~~24~~, wherein a location of the uplink resources is determined based at least in part on a first decoded instance of the DCI, and wherein one or more subsequent instances of the DCI are ignored.

~~28.~~—The method of claim ~~24~~, wherein the decoding further comprises:
~~combining multiple instances of the DCI, and wherein the uplink resources are further identified based at least in part on the combined DCI.~~

29.—~~The method of claim 28, wherein the DCI includes an explicit indication of the uplink resources or an implicit indication of uplink resources based on an index of a starting control channel element (CCE) of the DCI.~~

30.—~~The method of claim 29, wherein the starting CCE of the DCI is a same CCE for each of the plurality of repetitions of the DCI.~~

31.—~~The method of claim 29, wherein the starting CCE of the DCI is a different CCE for at least one of the plurality of repetitions of the DCI, and wherein the implicit indication of the uplink resources is based on an index of the starting CCE of a first instance of the DCI.~~

32.—~~A method for wireless communication at a base station, comprising:~~
~~identifying a plurality of transmission time intervals (TTIs) for transmission of a plurality of repetitions of downlink control information (DCI) to a user equipment (UE);~~
~~formatting at least a first instance of the DCI to indicate uplink resources allocated for the UE to acknowledge receipt of transmissions in all of the plurality of TTIs;~~
~~and~~
~~transmitting the plurality of repetitions of DCI to the UE in at least a subset of the plurality of transmission time intervals (TTIs).~~

33.—~~The method of claim 32, wherein the DCI indicates a number of TTIs of the plurality of TTIs.~~

34.—~~The method of claim 32, wherein each repetition of the DCI includes an index indicating a location of the uplink resources relative to a TTI of the plurality of TTIs containing the DCI, and wherein the index of each subsequent repetition of the DCI is adjusted to indicate a same location of the uplink resources.~~

35.—~~The method of claim 32, wherein a location of the uplink resources is determined based at least in part on a first decoded instance of the DCI, and wherein one or more subsequent instances of the DCI are ignored.~~

36.—~~The method of claim 32, wherein:~~

~~multiple instances of the DCI are combined at the UE, and wherein the multiple instances of the DCI include identical information.~~

~~37. The method of claim 36, wherein the DCI includes an explicit indication of the uplink resources.~~

~~38. The method of claim 36, wherein the DCI includes an implicit indication of uplink resources based on index of a starting control channel element (CCE) of the DCI.~~

~~39. 20. An apparatus for wireless communication at a user equipment (UE), comprising:~~
~~— means for identifying a processor,~~
memory in electronic communication with the processor; and
instructions stored in the memory and executable by the processor to cause the apparatus to:
identify a first set of control channel resources in a first transmission time interval (TTI) of a plurality of TTIs in which repetitions of a downlink shared channel transmission to the UE are transmitted;
~~— means for rate-matching~~match each repetition of the downlink shared channel transmission in each of the plurality of TTIs based at least in part on the first set of control channel resources to identify shared channel resources in each of the plurality of TTIs; and
~~— means for receiving~~receive the downlink shared channel transmission via the shared channel resources in each of the plurality of TTIs.

~~40. The apparatus of claim 39, wherein:~~
the first set of control channel resources comprises a subset of a set of resources configurable for control channel transmissions, ~~and wherein~~
the shared channel resources in each of the plurality of TTIs comprise at least a portion of the set of resources configurable for control channel transmissions, and

~~41. The apparatus of claim 39, wherein the first set of control channel resources are configured dynamically in first control information, and wherein the apparatus further comprises:~~

~~means for wherein the rate-matching comprises:~~
determining a rate-matching mode for the first set of control channel resources based at least on a dynamic indication field in ~~the~~ first control information;
~~means for rate-matching~~ the downlink shared channel transmission of the first TTI based at least in part on the determined rate-matching mode; and
~~means for rate-matching~~ each remaining TTI of the plurality of TTIs based at least in part on the rate-matching mode for the first set of control channel resources.

21. The apparatus of claim 20, wherein the first set of control channel resources are configured dynamically in first control information, and wherein the instructions are further executable by the processor to cause the apparatus to:

determine a rate-matching mode for the first set of control channel resources based at least on a dynamic indication field in the first control information.

~~42.—The apparatus of claim 41~~22. The apparatus of claim 21, wherein the dynamic indication field indicates rate-matching around only the first control information or rate-matching around an entire resource block (RB) set and whether such rate-matching is performed in the presence or absence of control information within a TTI, and wherein the rate-matching of each remaining TTI is performed according to the dynamic indication field and assuming that none of the remaining TTIs include control information.

~~43.—23.~~ The apparatus of claim ~~41~~21, wherein the rate-matching each remaining TTI is performed according to a semi-static configuration to rate-match around an entire resource block (RB) set.

~~44.—24.~~ An apparatus for wireless communication at a base station, comprising:
~~means for identifying a processor,~~
~~memory in electronic communication with the processor; and~~
~~instructions stored in the memory and executable by the processor to cause the apparatus to:~~
identify a first set of control channel resources in a first transmission time interval (TTI) of a plurality of TTIs in which repetitions of a downlink shared channel transmission to a user equipment (UE) are transmitted, wherein the first set of control channel resources comprises a subset of a set of resources configurable for control channel transmissions and shared channel resources in each of the plurality of TTIs for the downlink shared channel transmissions comprise at least a portion of the set of resources configurable for control channel transmissions;

~~means for rate-matching~~match each repetition of the downlink shared channel transmission in each of the plurality of TTIs based at least in part on the first set of control channel resources;
~~and~~

~~means for transmitting the repetitions of the downlink shared channel transmission in each of the plurality of TTIs.~~

~~45.—The apparatus of claim 44, wherein the first set of control channel resources are configured dynamically in first control information, and wherein the apparatus further comprises:~~

~~means for dynamically~~rate matching includes determining a rate-matching mode for the first set of control channel resources;

~~means for,~~setting a dynamic indication field in the first control information to indicate the rate-matching mode to the UE;

~~means for,~~rate-matching the downlink shared channel transmission of the first TTI based at least in part on the determined rate-matching mode; and

~~means for rate-matching each remaining TTI of the plurality of TTIs based at least in part on the rate-matching mode for the first set of control channel resources; and~~
transmit the repetitions of the downlink shared channel transmission in each of the plurality of TTIs.

46.—~~25.~~ The apparatus of claim ~~45~~24, ~~wherein the first set of control channel resources are configured dynamically in first control information.~~

26. The apparatus of claim 25, wherein the dynamic indication field indicates rate-matching around only the first control information or rate-matching around an entire resource block (RB) set and whether such rate-matching is performed in the presence or absence of control information within a TTI, and wherein the rate-matching each remaining TTI is performed according to the dynamic indication field and assuming that none of the remaining TTIs include control information.

47.—~~27.~~ The apparatus of claim ~~45~~25, ~~wherein the instructions are further comprising executable by the processor to cause the apparatus to:~~

~~means for providing~~provide a semi-static configuration to the UE to rate-match around an entire resource block (RB) set or to not perform rate-matching in each remaining TTI after the first TTI.

~~48.—An apparatus for wireless communication at a user equipment (UE), comprising:~~

~~means for receiving a plurality of repetitions of downlink control information (DCI) in a plurality of transmission time intervals (TTIs);~~

~~means for decoding at least a first instance of the DCI received in at least a first TTI of the plurality of TTIs; and~~

~~means for identifying uplink resources for acknowledging receipt of transmissions in all of the plurality of TTIs based at least in part on the first instance of the DCI.~~

~~49.—An apparatus for wireless communication at a base station, comprising:~~
~~means for identifying a plurality of transmission time intervals (TTIs) for transmission of a plurality of repetitions of downlink control information (DCI) to a user equipment (UE);~~

~~means for formatting at least a first instance of the DCI to indicate uplink resources allocated for the UE to acknowledge receipt of transmissions in all of the plurality of TTIs; and~~

~~means for transmitting the plurality of repetitions of DCI to the UE in at least a subset of the plurality of transmission time intervals (TTIs).~~